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(71) Applicant: Gidue S.p.a.
22078 Turate (Prov. of Como) (IT)

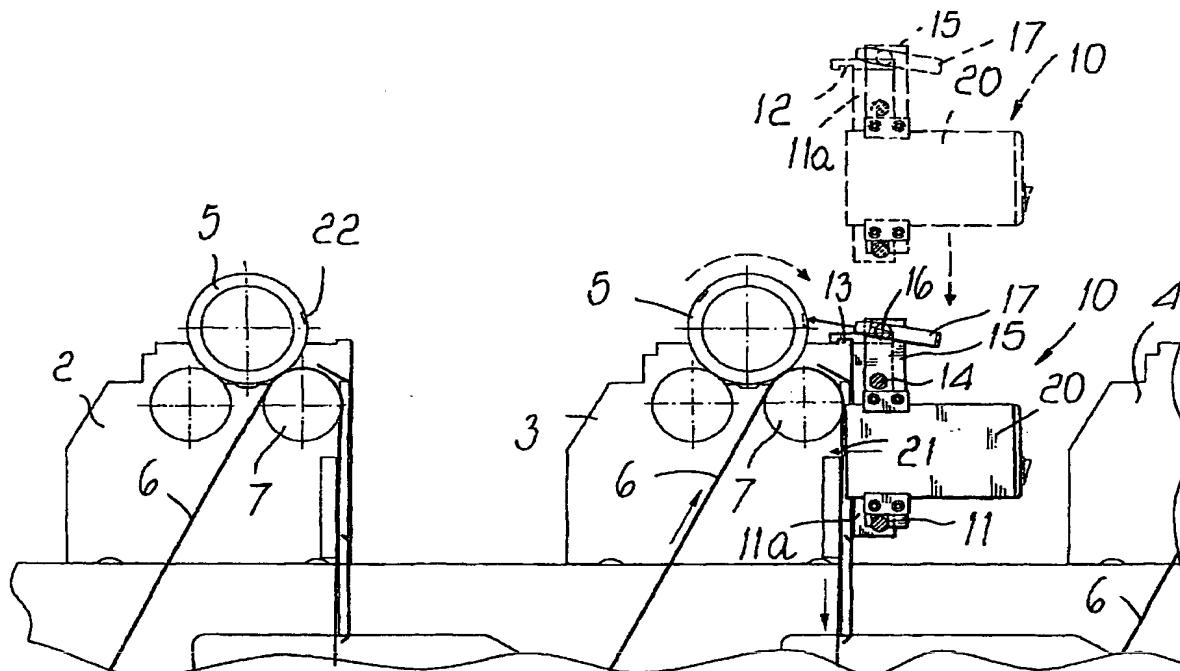
(72) Inventor: D'Annunzio, Federico
22078 Turate (Prov. of Como) (IT)

(74) Representative: Modiano, Guido, Dr.-Ing. et al
Modiano & Associati SpA
Via Meravigli, 16
20123 Milano (IT)

(54) Device for calibrating the printing plate cylinder for a flexographic printing machine

(57) A device for calibrating printing plate cylinders, particularly for a flexographic printing machine, which comprises a supporting frame (11) that is suitable to be arranged at a printing station (2, 3, 4) of a flexographic printing machine, in a position that substantially faces the printing plate cylinder (5), sensing means (20) that is rigidly coupled to the supporting frame (11) and is suit-

able to detect a marking (21) that is present on the printing paper (6), pointing means (17) which can be pointed at a marking (22) provided on the outer surface of the printing plate cylinder (5), in order to set the marking of the printing plate cylinder in register with the marking provided on the printed paper and detected by the sensing means.



Description

[0001] The present invention relates to a device for calibrating the position of the printing plate cylinder in a flexographic printing machine.

[0002] It is known that a flexographic printing machine is generally constituted by a plurality of printing stations, each provided with its own printing plate cylinder which, by making contact with the paper or film to be printed, in contrast with a counterpressure roller, prints onto the paper or film.

[0003] However, since currently color printing must be performed in multiple passes, one for each color, each printing station is generally dedicated to a specific color to be printed onto the paper or film.

[0004] For this purpose, the operator, before beginning the printing process, must perform a manual calibration of all the printing plate cylinders. The printing paper is in fact unwound from a reel, passes through the various printing stations, and is printed with a portion of the final image in each station. However, the printing of the various stations must be "synchronized" so that it is aligned; essentially, the color printed by the printing station in a given position of the paper or film must coincide, as regards its position, with the color that a subsequent printing station will print over the same image, so as to obtain the finished image having the appropriate shades without image misalignments.

[0005] In order to be able to perform the synchronization or calibration of the various printing stations, the paper or film onto which the image is to be printed has a marking, and likewise the printing plate cylinder has, on its surface, a marking that allows manual calibration of the position of the printing plate cylinder with respect to the sheet to be printed that passes under it.

[0006] However, a fully manual calibration of the relative positions of the various printing plate cylinders inevitably entails, in addition to a considerable time commitment, the need to perform test prints for a long time in order to exactly calibrate all the printing plate cylinders.

[0007] The aim of the present invention is to provide a device for calibrating printing plate cylinders for a flexographic printing machine in which such calibration is performed in a substantially automated manner for all the printing stations.

[0008] Within this aim, an object of the present invention is to provide a device for calibrating the position of the printing plate cylinders for a flexographic printing machine in which the calibration performed for the first printing station can be repeated in a substantially automated manner for the remaining stations.

[0009] Another object of the present invention is to provide a device for calibrating printing plate cylinders for a flexographic printing machine that can be easily positioned and removed for transfer from one printing station to the next.

[0010] Another object of the present invention is to

provide a device for calibrating printing plate cylinders for a flexographic printing machine that minimizes the print tests before being able to perform the actual print run.

5 [0011] Another object of the present invention is to provide a device for calibrating printing plate cylinders for a flexographic printing machine that is highly reliable, relatively simple to manufacture and at competitive costs.

10 [0012] This aim and these and other objects that will become better apparent hereinafter are achieved by a device for calibrating printing plate cylinders, particularly for a flexographic printing machine, which comprises a supporting frame that is suitable to be arranged at a printing station of a flexographic printing machine, in a position that substantially faces the printing plate cylinder, sensing means that is rigidly coupled to said supporting frame and is suitable to detect a marking that is present on the printing paper, pointing means which can be pointed at a marking provided on the outer surface of said printing plate cylinder, in order to set said marking of the printing plate cylinder in register with said marking provided on the printed paper and detected by said sensing means.

15 [0013] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the calibration device according to the present invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic side elevation view of a portion of a flexographic printing machine, illustrating three printing stations with the calibration device according to the invention applied to one of them;

35 Figure 2 is a schematic side elevation view of the same portion of the flexographic printing machine illustrated in Figure 1, with the calibration device arranged on a subsequent printing station with respect to the printing station on which it is arranged in Figure 1;

40 Figure 3 is a schematic side elevation view of a printing station with different printing plate cylinders; and

45 Figure 4 is a perspective view of the calibration device according to the present invention.

[0014] With reference to the figures, a flexographic printing machine, generally designated by the reference numeral 1, comprises a plurality of printing stations 2, 3 and 4 (for sake of simplicity only three printing stations are shown in Figure 1) and each printing station comprises a printing plate cylinder 5, which is designed to print the intended image onto the printing paper or film 6 that passes under it on a counterpressure roller 7.

[0015] The device according to the present invention, generally designated by the reference numeral 10, comprises a supporting frame 11 provided with two lateral

posts 11a and 11b being provided in an upward region with engagement means 12 suitable to engage corresponding lugs 13 that protrude from the shoulders of each printing station 2, 3 and 4.

[0016] The lateral posts 11a and 11b of the device 10 are conveniently connected one another by rod-like elements 14 that are suitable to rigidly couple them.

[0017] The device according to the present invention further comprises a supporting element 15, which is rigidly coupled to the rod-like elements 14 and is provided with a protruding arm 16 that is suitable to support pointing means 17 conveniently constituted by a laser beam source, a mechanical pointer, and the like.

[0018] The pointing means can be orientated about an axis that is arranged longitudinally between the posts 11a and 11b.

[0019] The printing paper or ribbon 6 has, in an appropriate position, markings 7 that are suitable to allow its centering. Such markings are read by sensing means 20, which is conveniently constituted for example by a photocell that is suitable to read the marking 7 and stop the movement of the printing paper or ribbon 6 when the marking is read.

[0020] In turn, the printing plate cylinder 5 has a marking 22 that is used to calibrate the position of the cylinder with respect to the image that is printed onto the printing paper or ribbon 6.

[0021] The pointing means 17, which can be orientated about a longitudinal axis that is arranged substantially parallel to the diametrical axis of the printing plate cylinder 5, is meant to point the marking 22 provided on the printing plate cylinder 5.

[0022] The sensing means 20 is connected to the control unit of the printing machine, so as to stop the advancement of the paper when said means detects the marking 21 provided on the printing paper or ribbon.

[0023] With reference to the above cited figures, the operation of the calibration device according to the present invention is as follows.

[0024] First of all, the operator places the frame 11 on the printing machine, at the first printing station 2, so that the engagement means 12, conveniently constituted by lugs formed at the top of the posts 11a and 11b, engage the protruding teeth 13 formed on the shoulders of the printing station 2.

[0025] Once the frame 11 has been positioned, the operator actuates the flexographic printing machine and causes the advancement of the printing paper or ribbon 6 until the sensing means 20 detects the marking 21 provided on the printing paper or ribbon. At this point the sensing means 20 stops the machine in order to block the advancement of the paper.

[0026] At this point the operator correctly positions the printing plate cylinder and by adjusting the angle of the pointing means points with said means the marking 22 provided on the surface of the printing plate cylinder 5 so as to determine the angle of the pointing means that allows optimum pointing at the marking 22.

[0027] With the above described operations, therefore, the marking 21 provided on the printing paper or ribbon and the marking 22 provided on the outer surface of the printing plate cylinder 5 are perfectly in step with each other.

[0028] At this point the operator, without altering the angle of the pointing means 17, removes the frame 11 from the first printing station and positions it at the second printing station.

[0029] At this point the printing paper is advanced again, by operating the flexographic machine, until the sensing means 20 again detects the marking 21 provided on the printing paper or ribbon 6.

[0030] When the sensing means 20 detects said marking, the advancement of the paper is halted again and the operator merely has to adjust the position of the printing plate cylinder 5 so that its marking 22 is pointed by the pointing means 17, which have maintained the angle found earlier at the first printing station.

[0031] These operations are then repeated for each printing station, so as to calibrate all the printing plate cylinders and set them in register with each other and, of course, with respect to the printing paper.

[0032] Moreover, the calibration device is particularly suitable when the diameter of the printing plate cylinders varies between printing stations, so that the marking provided on the outer surface of each printing plate cylinder assuredly never finds itself in the exact position and therefore a calibration step is inevitably necessary.

[0033] Such calibration step is in any case substantially always necessary even if the printing plate cylinders do not vary their diameter between printing stations.

[0034] Figure 2 illustrates in dashed lines the positioning of a printing plate cylinder 5 that has a smaller diameter than the printing plate cylinder located for example in a preceding printing station.

[0035] In practice it has been found that the calibration device according to the present invention fully achieves the intended aim and objects, since it allows calibration of all the printing plate cylinders of the various printing stations for a flexographic printing machine without having to perform long test prints and therefore with very short calibration times.

[0036] The device thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0037] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements and to the state of the art.

[0038] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do-not have any limiting effect on

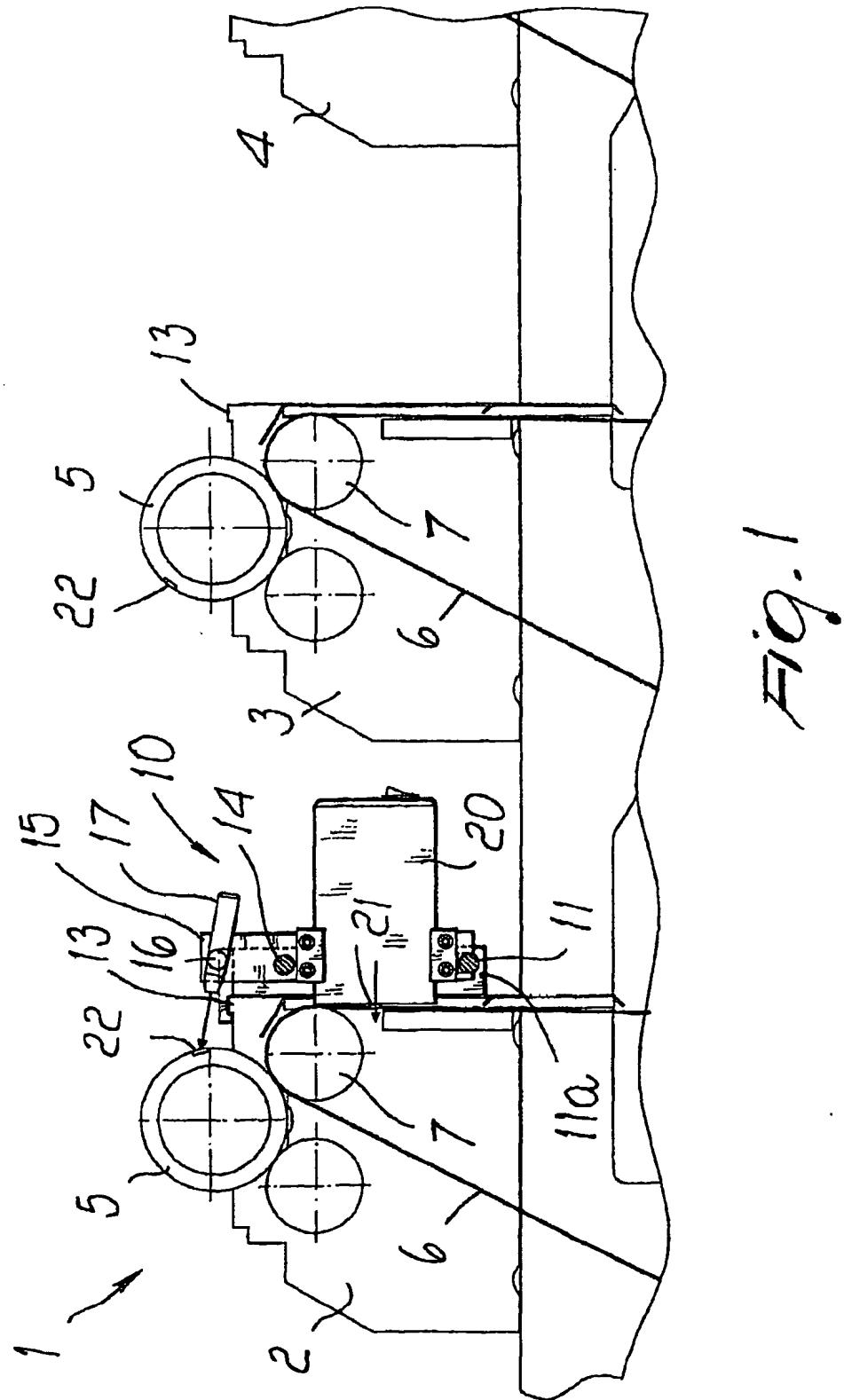
the scope of each element identified by way of example by such reference signs.

Claims

1. A device for calibrating printing plate cylinders, particularly for a flexographic printing machine, **characterized in that** it comprises a supporting frame that is suitable to be arranged at a printing station of a flexographic printing machine, in a position that substantially faces the printing plate cylinder, sensing means that is rigidly coupled to said supporting frame and is suitable to detect a marking that is present on the printing paper, pointing means which can be pointed at a marking provided on the outer surface of said printing plate cylinder, in order to set said marking of the printing plate cylinder in register with said marking provided on the printed paper and detected by said sensing means. 10
2. The calibration device according to claim 1, **characterized in that** said sensing means comprises sensor means suitable to detect the presence of said marking on the printing paper and to stop the actuation of said flexographic printing machine following the detection of said marking. 15
3. The device according to claim 1, **characterized in that** said pointing means can be set at an angle with respect to a longitudinal axis that is parallel to the diametrical axis of said printing plate cylinder, for the pointing of said marking provided on the outer surface of said printing plate cylinder. 20
4. The calibration device according to one or more of the preceding claims, **characterized in that** said pointing means comprises a laser source. 25
5. The calibration device according to one or more of the preceding claims, **characterized in that** said pointing means comprises a mechanical pointer, 30
6. The device according to one or more of the preceding claims, **characterized in that** said pointing means is supported by an arm that protrudes from a supporting element that is rigidly coupled to said frame. 45
7. The calibration device according to one or more of the preceding claims, **characterized in that** said frame can be arranged at a pair of shoulders of said printing station of the flexographic printing machine. 50
8. The calibration device according to one or more of the preceding claims, **characterized in that** said frame has two posts, each provided with engagement means that is suitable to engage correspond-

ing protruding teeth of the shoulders of said printing station.

9. A method for calibrating printing plate cylinders, particularly for a flexographic printing machine, by using a calibration device according to one or more of the preceding claims, **characterized in that** it comprises the steps of:
 positioning the calibration device at a first printing station of said flexographic printing machine;
 advancing the printing paper until the sensing means of said calibration device detects a marking provided on said printing paper;
 stopping the actuation of said flexographic printing machine following the detection of said marking provided on said printing paper;
 positioning said printing plate cylinder manually in the correct position so that a marking thereof is in register with the marking detected on the printing paper;
 pointing the pointing means at the marking provided on said printing plate cylinder;
 removing the calibration device and repositioning it on the second printing station;
 advancing again the printing paper until said sensing means again detects the marking provided on said printing paper;
 actuating said pointing means, keeping its position with respect to the first printing station unchanged, and pointing said pointing means on the surface of said printing plate cylinder, turning said printing plate cylinder until the marking of said printing plate cylinder is pointed by said pointing means; and
 repeating the above operation for all subsequent printing stations. 35



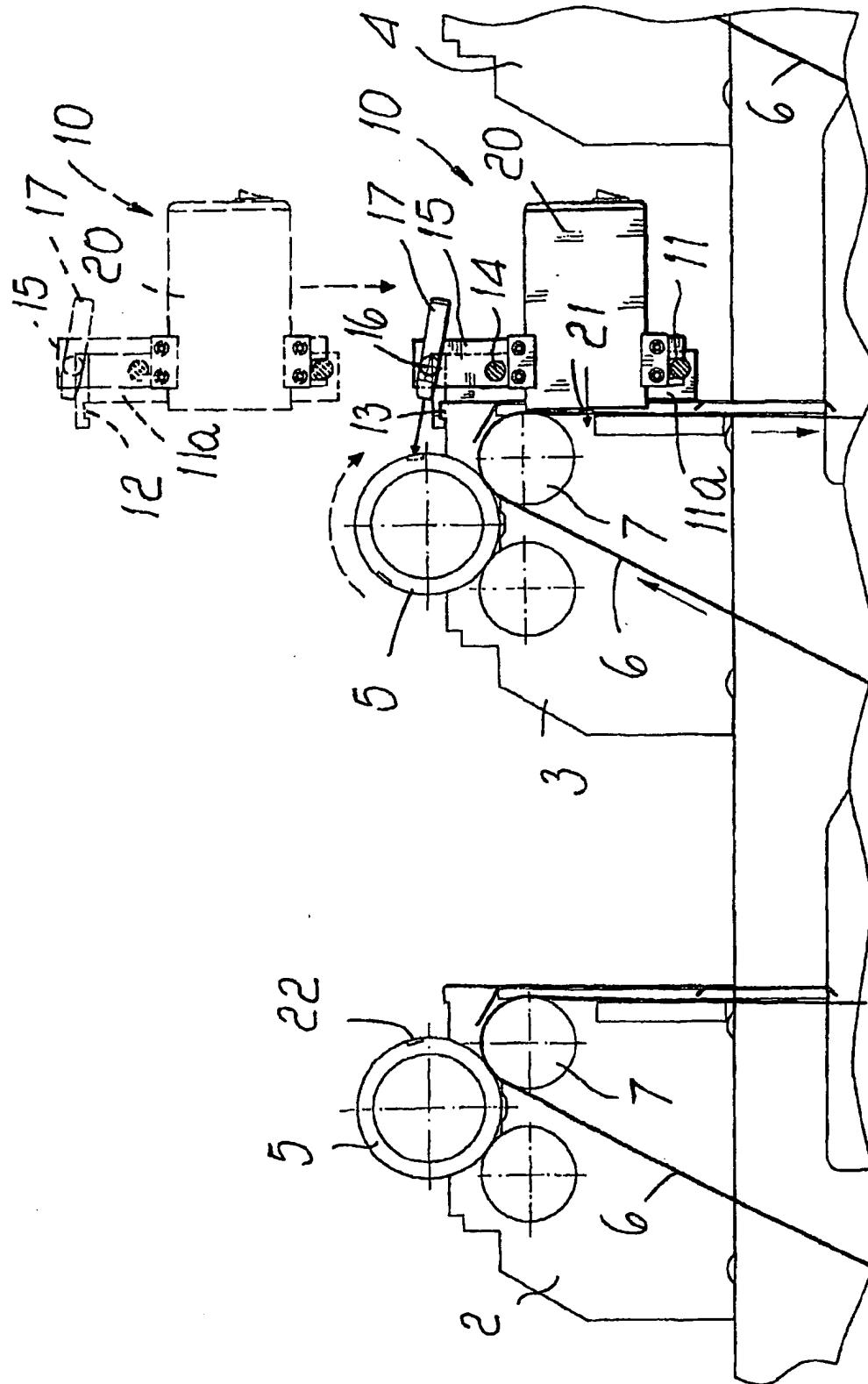


Fig. 2

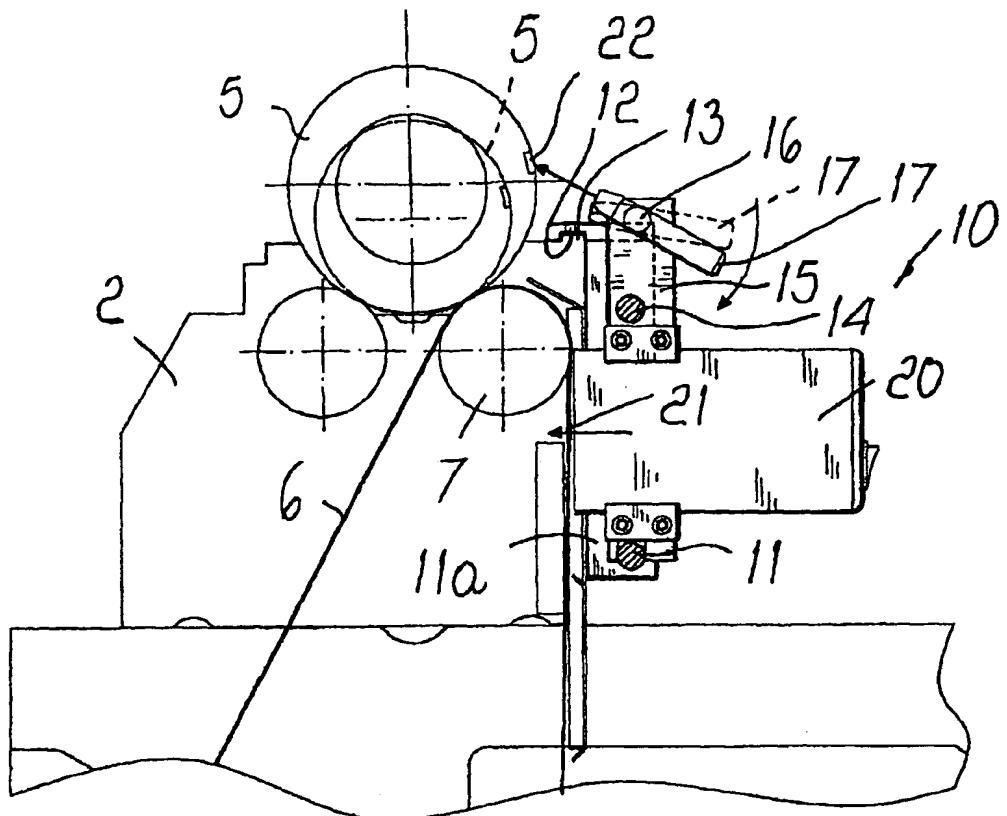


FIG. 3

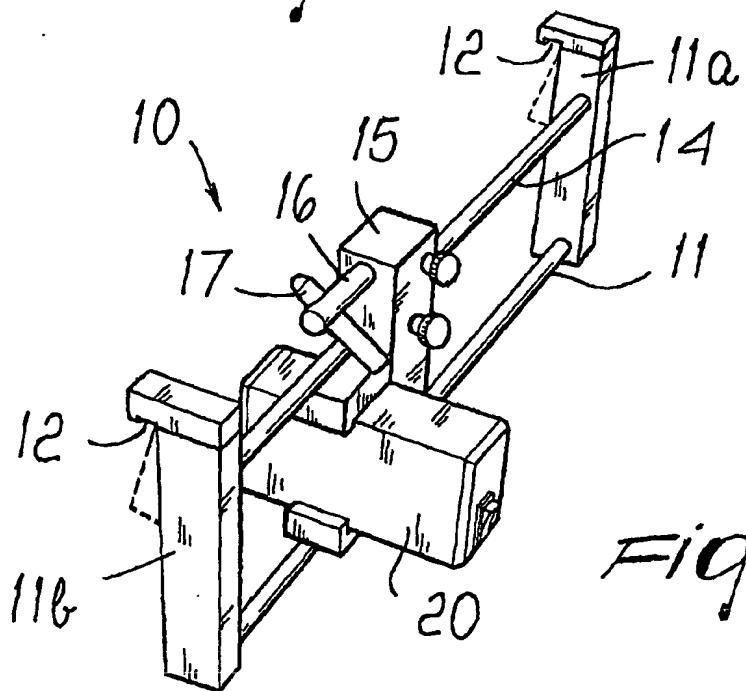


FIG. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0602

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	* page 7, paragraph 2 - page 11, last line; figures 1-6 *	9	
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The present search report has been drawn up for all claims			
Place of search MUNICH	Date of completion of the search 18 February 2002	Examiner Greiner, E	
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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